Registration No: | | | | | | | | | | |

Total Number of Pages : 02 **M.Sc.**

16MPYE305

3rd Semester Regular Examination 2017-18
Condensed Matter Physics-I
BRANCH : M.Sc. (AP)
Time : 3 Hours
Max Marks : 70
Q.CODE : B580

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions:** **(2 x 10)**

a) What is effective mass? Why it vary for electron in a crystal?
b) Differentiate between reduced zone scheme and extended zone scheme.
c) What is Shubinkov de Hass effect?
d) What is Weidemann – Franz law?
e) What are normal modes of a system?
f) What are Bloch functions? What is its significance?
g) What is Onsagar – Lifshitz quantization condition?
h) What is Harrison's construction? Write the steps in Harrison's construction for finding the Fermi surface.
i) Write Seeback effect? Write the expression for thermoelectric power in this effect.
j) What is Plasma frequency? How it is related to dielectric constant of a material.

Q2 **a)** Write the wave equation for electron in a periodic potential. Explain formation of energy gap in solid using nearly free electron approximation. **(5)**
b) What are Brillouin zones? How is it constructed? Describe and sketch the first Brillouin zone of BCC and FCC lattices. Mention their importance in crystal analysis. **(5)**

Q3 **a)** What is tight binding approximation? Describe the tight binding approximation for calculating the energy states of an electron in solid. **(5)**
b) Give an account of de Hass-Van Alpher effect. Explain why it is considered to be the most powerful method for the study of Fermi surface. **(5)**

Q4 **a)** What is Fermi surface? What is its importance? Discuss the characteristics of Fermi surface. **(5)**
b) What are open orbits and Closed orbits? Explain with suitable diagram. **(5)**

Q5 **a)** Derive Lindhand's expression for determination of dielectric function of an interacting electron gas. **(5)**
b) What is Static screening? Derive Debye-Hucked formula. **(5)**

Q6 **a)** What is Kohn effect? Derive expression for dielectric constant and show the variation of screening parameter with wave number graphically to explain Kohn effect. **(5)**

b) State and explain Friedel Sum rule? **(5)**

Q7 **a)** Derive the Boltzmann equation (transport equation). **(5)**

b) Derive Bloch-Gruneisen law for metals. **(5)**

Q8 **Write short answer on any two:** **(5 x 2)**

a) Born-Openheimer Approximation.

b) Harmonic approximation.

c) Quantum Hall effect.

d) Magnetoresistance.